PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF THE RECORDING OF A CHANGE

(PCT Rule 92bis.1 and Administrative Instructions, Section 422)

To:

KOLSTER OY AB
Iso Roobertinkatu 23
P.O. Box 148
FIN-00121 Helsinki
FINLANDE

Date of mailing (day/month/year)	
09 November 1999 (09.11.99)	
Applicant's or agent's file reference	**IMPORTANT NOTIFICATION**
2961612PC/ko	
International application No.	**International filing date (day/month/year)**
PCT/FI98/00545	22 June 1998 (22.06.98)

1. The following indications appeared on record concerning:

[X] the applicant [ ] the inventor [ ] the agent [ ] the common representative

Name and Address	State of Nationality	State of Residence
NOKIA TELECOMMUNICATIONS OY Keilalahdentie 4 FIN-02150 Espoo Finland	FI	FI
	Telephone No.	
	Facsimile No.	
	Teleprinter No.	

2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

[ ] the person [X] the name [ ] the address [ ] the nationality [ ] the residence

Name and Address	State of Nationality	State of Residence
NOKIA NETWORKS OY Keilalahdentie 4 FIN-02150 Espoo Finland	FI	FI
	Telephone No.	
	Facsimile No.	
	Teleprinter No.	

3. Further observations, if necessary:

4. A copy of this notification has been sent to:

[X] the receiving Office
[ ] the International Searching Authority
[ ] the International Preliminary Examining Authority
[ ] the designated Offices concerned
[X] the elected Offices concerned
[ ] other:

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer Jocelyne Rey-Millet
Facsimile No.: (41-22) 740.14.35	Telephone No.: (41-22) 338.83.38

PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

To:

United States Patent and Trademark Office
(Box PCT)
Crystal Plaza 2
Washington, DC 20231
ÉTATS-UNIS D'AMÉRIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 01 March 1999 (01.03.99)	
International application No. PCT/FI98/00545	**Applicant's or agent's file reference** 2961612PC/ko
International filing date (day/month/year) 22 June 1998 (22.06.98)	**Priority date** (day/month/year) 27 June 1997 (27.06.97)
Applicant PALVIAINEN, Keijo	

1. The designated Office is hereby notified of its election made:

[X] in the demand filed with the International Preliminary Examining Authority on:

22 January 1999 (22.01.99)

[ ] in a notice effecting later election filed with the International Bureau on:

2. The election [X] was

[ ] was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO **34, chemin des Colombettes** **1211 Geneva 20, Switzerland**	Authorized officer Maria Kirchner
Facsimile No.: (41-22) 740.14.35	Telephone No.: (41-22) 338.83.38

Ex

PATENT COOPERATION TREATY

PCT

REC'D 27 OCT 1999
WIPO PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 43188PCT/nu	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/FI98/00545	International filing date *(day/month/year)* 22.06.1998	Priority date *(day/month/year)* 27.06.1997
International Patent Classification (IPC) or national classification and IPC_6 H 04 Q 7/38, H 04 Q 7/22		
Applicant Nokia Telecommunications Oy et al		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 4 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 4 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the report
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
22.01.1999	05.10.1999
Name and mailing address of the IPEA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Telex 17978 PATOREG-S Facsimile No. 08-667 72 88	Authorized officer Peter Hedman/MN Telephone No. 08-782 25 00

Form PCT/IPEA/409 (cover sheet) (January 1994)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/FI98/00545

I. Basis of the report

1. This report has been drawn on the basis of *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.)*:

☐ the international application as originally filed.

☒ the description, pages 1-13 , as originally filed,
pages _____ , filed with the demand,
pages _____ , filed with the letter of _____ ,
pages _____ , filed with the letter of _____ .

☒ the claims, Nos. _____ , as originally filed,
Nos. _____ , as amended under Article 19,
Nos. _____ , filed with the demand,
Nos. 1-14 , filed with the letter of 23.08.1999 ,
Nos. _____ , filed with the letter of _____ .

☒ the drawings, ~~sheets~~/fig 1-11 , as originally filed,
~~sheets~~/fig _____ , filed with the demand
~~sheets~~/fig _____ , filed with the letter of _____ ,
~~sheets~~/fig _____ , filed with the letter of _____ .

2. The amendments have resulted in the cancellation of:

☐ the description, pages _____
☐ the claims, Nos. _____
☐ the drawings, ~~sheets~~/fig _____

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the supplemental Box (Rule 70.2(c)).

4. Additional observations, if necessary:

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/FI98/00545

V. Resoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	1-14	YES
	Claims		NO
Inventive step (IS)	Claims	1-14	YES
	Claims		NO
Industrial applicability (IA)	Claims	1-14	YES
	Claims		NO

2. Citations and explanations

The claimed invention relates to a method, and thereto related nodes, for implementing call forwarding in a mobile communication system wherein calls are automatically routed specifically for each basic service.

The problem mentioned above is, according to the claimed invention, solved by way of providing the forwarding exchange (GMSC; VMSC) with a basic service code, and by implementing call routing to the forwarding number according to the basic service code.

In the international search report the following documents were cited:

D1 WO 97 17816 A
D2 WO 95 310 76 A
D3 WO 97 07643 A
D4 O 95 20299 A

D1 teaches of a system, method and a visitor location register (VLR) for providing a service-dependent routing of a mobile-terminating call in a mobile communication system. In response to a roaming number request from a home location register (HLR), a visitor location register allocates a roaming number, comprising a service dependent part (SERVN), to the call. The roaming number is returned to the HLR and further to a routing exchange (GMSC, EXC). In the service dependent part one of two alternative routes is indicated, and thereby the routing exchange may route the call in accordance with the service requirements (See page 9, line 26 - page 12, line 35). The document fails to discuss call forwarding. Furthermore, calls are routed based on a roaming number, instead of being based on a basic service code, as suggested in the claimed invention.

.../...

Supplemental Box
(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of: V

D2 relates to a call forwarding method and arrangement for a mobile terminating call. Upon noticing that a called subscriber is busy, not reachable or does not answer, the HLR/VLR is checked for an activated call forwarding. As a reply to the roaming number allocation request, a reply message, comprising, in addition to the forwarding number, a BCIE, which is indicating the type of the call (data/speech), is transmitted to the requesting node (See page 5, line 3 - line 23; page 5, line 28 page 6, line 4). Although this document do discuss call forwarding, also D2 fails to teach of a method in which calls are routed base on a basic service code.

D3 refers to a method and a visitor location register for handling outgoing and incoming calls in a mobile communictions system employing a multi-numbering scheme. By providing an MSC with the correct one of multiple directory numbers according to a basic service related to a call, from a HLR via the VLR occasionaly serving the called subscriber, service specific routing of calls is achieved. The document do teach of a basic service code, which is utilised when employing a multi-numbering scheme. The document do, however, fail to teach of a procedure for providing call forwarding by way of providing a certain forwarding exchange with the basic service code.

D4 relates to a system, method and a thereto related MSC and HLR, for providing individual subscriber services in a cellular communications network, wherein the MSC sends a status information to the HLR, after which the HLR responds by determining supplementary call routing information (See page 11, line 32 - page 13, line 4). Also this document do fail to suggest the utilisation of a basic service code when providing call forwarding ot the subscriber.

None of the cited documents do teach of a method for providing call forwarding to a subscriber by way of providing a basic service code to the forwarding exchange, and, thereby, simplifies the procedure of providing call forwarding for roaming subscribers. Since it is not considered as obvious to the person skilled in the art to come up with a comparable solution, considering what is previously known from the cited documents, what is claimed in the amended claims 1-14 is novel, is considered to involve an inventive step, and have industrial applicability.

CLAIMS

Amended on August 20, 1999

1. A method for implementing call forwarding in a mobile system comprising at least one forwarding exchange (GMSC; VMSC) for carrying out call forwarding on the basis of subscriber data related to the call forwarding, at least one subscriber database (HLR; VLR) for storing the subscriber data related to the call forwarding, the method comprising the steps of

receiving at the forwarding exchange (GMSC; VMSC) a call set-up message addressed to a subscriber in the mobile system,

performing a subscriber data request to the subscriber database (HLR; VLR),

transmitting a response message from the subscriber database (HLR; VLR) to the forwarding exchange (GMSC; VMSC), the message containing data indicating the call forwarding and a forwarding number, **characterized** by

providing the forwarding exchange (GMSC; VMSC) with a basic service code, and

implementing call routing to the forwarding number according to the basic service code.

2. A method for implementing call forwarding in a mobile system comprising at least a first exchange (GMSC) for carrying out call forwarding on the basis of subscriber data related to the call forwarding, at least one home location register (HLR) connected to the first exchange for storing the subscriber data related to the call forwarding, the method comprising the steps of

receiving at the first exchange (GMSC) a call set-up message addressed to a subscriber in the mobile system,

requesting routing information from the home location register (HLR),

transmitting a response message from the home location register (HLR) to the first exchange (GMSC), the message containing data indicating the call forwarding and a forwarding number, **characterized** by

providing the forwarding exchange (GMSC) with a basic service code indicating the basic service related to the call in connection with the call set-up message or a response message to said routing information request,

implementing call routing to the forwarding number according to said basic service code.

3. A method according to claim 2, **characterized** in that the basic service code is forwarded from the home location register (HLR) to the first exchange (GMSC) via an extension added to the response message Send_Routing_Info_RES to the routing information request.

4. A method for implementing call forwarding in a mobile system comprising at least one exchange (VMSC) for carrying out call forwarding on the basis of subscriber data related to the call forwarding, at least one visitor location register (VLR) for storing the subscriber data related to the call forwarding, the method comprising the steps of

receiving at the exchange (VMSC) a call set-up message addressed to a subscriber in the mobile system,

providing a subscriber data request to the visitor location register (VLR) connected to the exchange,

transmitting a response message from the visitor location register (VLR) to the exchange (VMSC), the message containing data indicating the call forwarding and a forwarding number, **characterized** by

providing the forwarding exchange (VMSC) with a basic service code in connection with the call set-up message or said response message, and

implementing call routing to the forwarding number according to the basic service code.

5. A home location register (HLR) connected to a first exchange (GMSC) in a mobile system, **characterized** in that the home location register (HLR) is arranged to transmit a basic service code to the first exchange (GMSC) in connection with a response message to a routing information request, the data indicating the basic service related to the call.

6. A home location register (HLR) according to claim 5, **characterized** in that the home location register (HLR) is arranged to forward the basic service code to the first exchange (GMSC) by means of an extension added to the response message Send_Routing_Info_RES to the routing information request.

7. A first exchange (GMSC) in a mobile system, comprising means for transferring a call to a forwarding number, **characterized** in that the exchange is arranged to derive a basic service code from the call set-up

message or from a response message transmitted by the home location register (HLR) to the first exchange (GMSC) in response to a subscriber data request, and

the exchange (GMSC) is arranged to route the call to the forwarding number according to the basic service code.

8. An exchange according to claim 7, **characterized** in that the exchange is arranged to receive the basic service code in an extension added to the response message Send_Routing_Info_RES to the routing information request.

9. An exchange (GMSC) according to claim 7, **characterized** in that said forwarding number is the number of a Voice Mail Service center having several lines, and that said exchange is arranged to transfer the call to the Voice Mail Service center via a line selected for the transfer according to the basic service code.

10. An exchange (GMSC) according to claim 7, **characterized** in that the exchange (GMSC) is arranged to subject the forwarding number to a conversion selected according to the basic service code.

11. An exchange (VMSC) in a mobile system, comprising means for transferring a call to a forwarding number, **characterized** in that the exchange is arranged to derive a basic service code from basic service data that indicates the basic service of the call and that is transmitted in connection with the call set-up message or a response message transmitted from the visitor location register (VLR) to the exchange (VMSC) in response to a subscriber data request, and

the exchange (VMSC) is arranged to perform routing to the forwarding number according to said basic service code.

12. An exchange according to claim 11, **characterized** in that the exchange is arranged to derive the basic service code at least on the basis of the bearer capability information element contained in the basic service data.

13. An exchange (VMSC) according to claim 11, **characterized** in that said forwarding number is the number of a Voice Mail Service center having several lines, and that said exchange is arranged to transfer the call to the Voice Mail Service center via a line selected for the transfer according to the basic service code.

14. An exchange (VMSC) according to claim 11, **characterized** in that the exchange (VMSC) is arranged to subject the forwarding number to a conversion selected according to the basic service code.

PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 :
H04Q 7/38, 7/22

A1

(11) International Publication Number: WO 99/01004

(43) International Publication Date: 7 January 1999 (07.01.99)

(21) International Application Number: PCT/FI98/00545

(22) International Filing Date: 22 June 1998 (22.06.98)

(30) Priority Data:
972789 27 June 1997 (27.06.97) FI

(71) Applicant *(for all designated States except US)*: NOKIA TELECOMMUNICATIONS OY [FI/FI]; Keilalahdentie 4, FIN–02150 Espoo (FI).

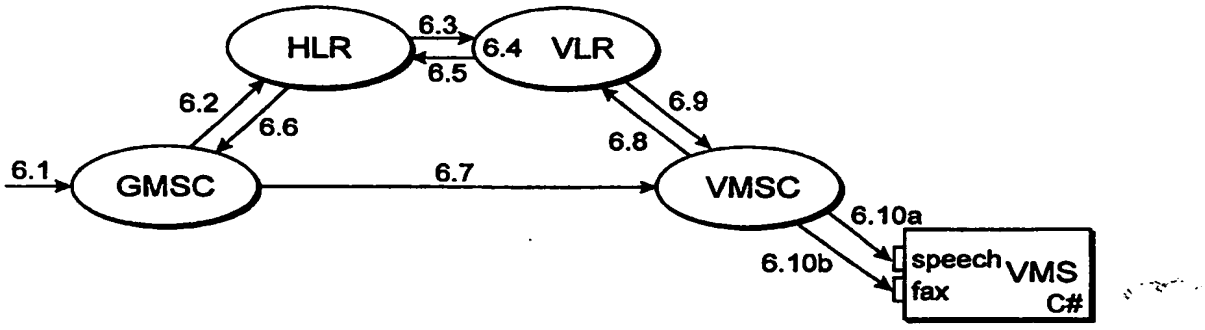
(72) Inventor; and
(75) Inventor/Applicant *(for US only)*: PALVIAINEN, Keijo [FI/FI]; Halmetie 6 A 2, FIN–00700 Helsinki (FI).

(74) Agent: KOLSTER OY AB; Iso Roobertinkatu 23, P.O. Box 148, FIN–00121 Helsinki (FI).

(81) Designated States: AL, AM, AT, AT (Utility model), AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, CZ (Utility model), DE, DE (Utility model), DK, DK (Utility model), EE, EE (Utility model), ES, FI, FI (Utility model), GB, GE, GH, GM, GW, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SK (Utility model), SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).

Published
With international search report.
Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.

(54) Title: ROUTING OF CALL FORWARDING ACCORDING TO BASIC SERVICES



(57) Abstract

Method and equipment for implementing call forwarding in a mobile system comprising at least one forwarding exchange (GMSC; VMSC) and at least one subscriber database (HLR; VLR). The forwarding exchange (GMSC; VMSC) receives a call addressed to a subscriber in the mobile system, a subscriber data request is performed to a subscriber database (HLR; VLR) connected to the forwarding exchange, and a response message containing data indicating the call forwarding and a forwarding number is transmitted from the subscriber database (HLR; VLR) to the forwarding exchange (GMSC; VMSC). In the arrangement, basic service data indicating the basic service related to the call is also transmitted from the subscriber data base (HLR; VLR) to the forwarding exchange (GMSC; VMSC) in connection with the response message, a basic service code is derived from said service data, and the call is transferred to the forwarding number and the routing is arranged according to the basic service code. Due to the invention, the routing of the forwarded call can be implemented automatically in a desired manner.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	**ES**	Spain	**LS**	Lesotho	**SI**	Slovenia
AM	Armenia	**FI**	Finland	**LT**	Lithuania	**SK**	Slovakia
AT	Austria	**FR**	France	**LU**	Luxembourg	**SN**	Senegal
AU	Australia	**GA**	Gabon	**LV**	Latvia	**SZ**	Swaziland
AZ	Azerbaijan	**GB**	United Kingdom	**MC**	Monaco	**TD**	Chad
BA	Bosnia and Herzegovina	**GE**	Georgia	**MD**	Republic of Moldova	**TG**	Togo
BB	Barbados	**GH**	Ghana	**MG**	Madagascar	**TJ**	Tajikistan
BE	Belgium	**GN**	Guinea	**MK**	The former Yugoslav Republic of Macedonia	**TM**	Turkmenistan
BF	Burkina Faso	**GR**	Greece			**TR**	Turkey
BG	Bulgaria	**HU**	Hungary	**ML**	Mali	**TT**	Trinidad and Tobago
BJ	Benin	**IE**	Ireland	**MN**	Mongolia	**UA**	Ukraine
BR	Brazil	**IL**	Israel	**MR**	Mauritania	**UG**	Uganda
BY	Belarus	**IS**	Iceland	**MW**	Malawi	**US**	United States of America
CA	Canada	**IT**	Italy	**MX**	Mexico	**UZ**	Uzbekistan
CF	Central African Republic	**JP**	Japan	**NE**	Niger	**VN**	Viet Nam
CG	Congo	**KE**	Kenya	**NL**	Netherlands	**YU**	Yugoslavia
CH	Switzerland	**KG**	Kyrgyzstan	**NO**	Norway	**ZW**	Zimbabwe
CI	Côte d'Ivoire	**KP**	Democratic People's Republic of Korea	**NZ**	New Zealand		
CM	Cameroon			**PL**	Poland		
CN	China	**KR**	Republic of Korea	**PT**	Portugal		
CU	Cuba	**KZ**	Kazakstan	**RO**	Romania		
CZ	Czech Republic	**LC**	Saint Lucia	**RU**	Russian Federation		
DE	Germany	**LI**	Liechtenstein	**SD**	Sudan		
DK	Denmark	**LK**	Sri Lanka	**SE**	Sweden		
EE	Estonia	**LR**	Liberia	**SG**	Singapore		

ROUTING OF CALL FORWARDING ACCORDING TO BASIC SERVICES

BACKGROUND OF THE INVENTION

The invention relates to telecommunication systems and especially to a method and equipment for implementing call forwarding in a mobile system comprising at least one forwarding exchange for carrying out call forwarding on the basis of subscriber data related to the call forwarding, and at least one subscriber database for storing the subscriber data related to the call forwarding. The method comprises the steps of receiving at the forwarding exchange a call addressed to a subscriber in the mobile system, performing a subscriber data request to the subscriber database, and transmitting a response message from the subscriber database to the forwarding exchange, the message containing data indicating the call forwarding and a forwarding number.

Modern mobile systems provide subscribers with different data transmission properties in addition to conventional speech transmission. Mobile system services can be divided generally into teleservices and bearer services. A bearer service is a telecommunication service that constitutes the transmission of signals between user-network interfaces. For example modem services are bearer services. In a teleservice, the network also provides terminal services. Important teleservices in turn include speech, facsimile and videotex services.

One mobile subscriber may typically have access to different tele- and bearer services that are referred to in this connection as basic services. A subscriber may use for example a speech, facsimile and data service. A call terminating at or originating from a mobile station may therefore require any of these basic services, and therefore the correct service must be indicated to the mobile network. For example in a GSM mobile system, call set-up signalling transmitted by a mobile station contains data about the required basic service in a bearer capability information element (BCIE). In this manner, the mobile network is able to select the correct basic service for calls originating from the mobile station. Calls arriving from an integrated services data network (ISDN) also contain a corresponding information element that indicates the required service. However, if the call arrives from a public switched telephone network (PSTN) or travels through it, the mobile network does not receive such data concerning the service type of the call. In such a

case, the mobile network should know in some other manner the type of basic service required by the call.

A known solution to this problem is a multi numbering scheme, where a mobile subscriber has as many numbers as he has services to which he wants to receive incoming calls. The number is also called the mobile subscriber ISDN number, i.e. MSISDN. For example, a subscriber may have a number for a speech service, a facsimile service and a modem service. In a multi numbering scheme, the calling subscriber selects from the mobile subscriber's numbers the one corresponding to the desired service.

An additional service in mobile systems is call forwarding that may be activated by a subscriber. Call forwarding may be unconditional, in which case a call is always transferred to the new number given. Call forwarding may also be set to be conditional, for example when the subscriber is busy, does not respond or cannot be reached. Due to the multi numbering scheme, the subscriber may transfer different types of calls addressed to him to different numbers. However, this requires that the subscriber determines the basic service to which the forwarding is directed in connection with the activation of the forwarding. If no basic service is determined, all subscriber calls are transferred to the same number. When the subscriber determines the forwarding specifically for each basic service, he has to activate the forwarding several times and to manage separately the set of numbers related to each service, the activated forwarding procedures etc. The management of such functions requires that the users are well trained, which consumes resources. There is also the danger that functions that are found to be difficult are not used.

One of the most common forms of call forwarding is the voice mail service where a subscriber directs the received calls to be transferred, either unconditionally or conditionally, to a voice mail service centre (VMS) that attends to responding to the calls and that stores the messages left for the subscriber. Most VMSs are capable of distinguishing whether an incoming call is a speech call or a facsimile call, but this requires that for each call arriving at the VMS there is an equipment that identifies the incoming call type. The number and costs of the equipments required could be reduced considerably if different types of incoming calls would be directed to the exchange via different lines. In order for the calls to be transferred to the VMS, the called party number Cd# must be the same in the forwarding and therefore different

types of calls cannot be distinguished from one another on the basis of analysing the called party number.

BRIEF DESCRIPTION OF THE INVENTION

The object of the invention is to provide a method and equipment implementing the method such that call forwarding in a mobile system can be automatically routed specifically for each basic service. The objects of the invention are achieved with a method according to claim 1, characterized by providing the forwarding exchange with a basic service code, and implementing call routing to the forwarding number according to the basic service code.

The invention also relates to a method according to claim 2 for implementing call forwarding in a mobile system comprising at least a first exchange for carrying out call forwarding on the basis of subscriber data related to the call forwarding, at least one home location register connected to the first exchange for storing the subscriber data related to the call forwarding. The method comprises the steps of receiving at the first exchange a call set-up message addressed to a subscriber in the mobile system, requesting routing information from the home location register, and transmitting a response message from the home location register to the first exchange, the message containing data indicating the call forwarding and a forwarding number. The method is characterized by providing the forwarding exchange with a basic service code indicating the basic service related to the call in connection with the call set-up message or a response message to said routing information request, and implementing call routing to the forwarding number according to said basic service code.

The invention also relates to a method according to claim 4 for implementing call forwarding in a mobile system comprising at least one exchange for carrying out call forwarding on the basis of subscriber data related to the call forwarding, at least one visitor location register for storing the subscriber data related to the call forwarding. The method comprises the steps of receiving at the exchange a call set-up message addressed to a subscriber in the mobile system, providing a subscriber data request to the visitor location register connected to the exchange, and transmitting a response message from the visitor location register to the exchange, the message containing data indicating the call forwarding and a forwarding number. The method is characterized by providing the forwarding exchange

with a basic service code in connection with the call set-up message or said response message, and implementing call routing to the forwarding number according to the basic service code.

The invention also relates to a home location register according to claim 5 connected to a first exchange in a mobile system. The home location register is characterized in that it is arranged to transmit a basic service code to the first exchange in connection with a response message to a routing information request, the data indicating the basic service related to the call.

The invention also relates to a first exchange according to claim 7 in a mobile system, comprising means for transferring a call to a forwarding number. The exchange is characterized in that it is arranged to derive a basic service code from the call set-up message or from a response message transmitted by the home location register to the first exchange in response to a subscriber data request, and that the exchange is arranged to route the call to the forwarding number according to the basic service code.

The invention also relates to an exchange according to claim 11 in a mobile system, comprising means for transferring a call to a forwarding number. The exchange is characterized in that the exchange is arranged to derive a basic service code from basic service data that indicates the basic service of the call and that is transmitted in connection with the call set-up message or a response message transmitted from the visitor location register to the exchange in response to a subscriber data request, and that the exchange is arranged to perform routing to the forwarding number according to said basic service code.

The invention is based on providing the forwarding exchange with data by means of which the exchange is able to identify the basic service related to the call, and the exchange uses this data for further routing of the call. The basic service data may be transferred to the exchange during the call set-up, but the data about the call type is substantially transmitted in connection with signalling between the exchanges and the subscriber databases.

The arrangement according to the invention provides several advantages. When incoming calls can be separated automatically, their further routing can be selected in a desired manner. For example in the above-described case, calls arriving at the VMS can be routed from the forwarding exchange to different lines, so that there is no need for equipments identifying

the call type. In such a case, the costs for the operator are considerably reduced as the number of equipments required becomes smaller without the occurrence of any difficulties for the user concerning the activation of service forwarding.

The arrangement according to the invention also provides other advantages. The forwarding exchange may modify the forwarding number in accordance with the basic service code, and the calls can therefore be separated later according to the basic service for example via connections that offer different qualities and are correspondingly of different prices.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be described in greater detail in connection with preferred embodiments and with reference to the accompanying drawings, in which

Figure 1 is a block diagram illustrating the basic components of a GSM system,

Figure 2 illustrates the set-up of a call terminating at a mobile station (MS) in a GSM-type mobile system,

Figure 3 illustrates the general implementation of subscriber data in a home location register (HLR),

Figure 4 illustrates the call set-up procedure of a call terminating at an MS, including call forwarding activated by the HLR,

Figure 5 shows an example of an extension according to the invention in a SRI-Res message,

Figure 6 illustrates the call set-up procedure of a call terminating at an MS, including call forwarding activated by a visitor location register (VLR),

Figure 7 illustrates generally call forwarding data updated in the VLR in connection with a roaming number allocation request,

Figure 8 illustrates an example of utilizing a basic service code,

Figure 9 illustrates conditional call forwarding in a network supporting optimal routing,

Figure 10 is a flow chart illustrating a method according to the invention in case of call forwarding directed via the HLR, and

Figure 11 is a flow chart illustrating a method according to the invention in case of call forwarding directed via the VLR.

DETAILED DESCRIPTION OF THE INVENTION

The present invention is applicable for use in mobile systems where circuit switched data and speech calls can be set up. The invention can be especially used in a GSM mobile system and in similar more recent mobile systems, such as the DCS1800 (Digital Communication System) and the PCN (Personal Communication Network). In the following, the primary embodiment of the invention will be described in the GSM system, without restricting the invention thereto, however.

Figure 1 shows the basic components of the GSM system without describing in greater detail their properties or other parts of the system. For a more detailed description of the GSM system, reference is made to the GSM recommendations and *The GSM System for Mobile Communications* by M. Mouly and M. Pautet, Palaiseau, France, 1992, ISBN:2-9507190-0-0-7.

A mobile services switching centre MSC manages the switching of incoming and outgoing calls. It carries out similar functions as an exchange in a PSTN. In addition, it also performs functions, such as subscriber location management, that are only characteristic of mobile communication in connection with the network subscriber registers. In a GSM system, the subscriber registers include a home location register HLR and a visitor location register VLR. Subscriber data is stored permanently in the home location register HLR, as well as information on the visitor location register VLR in the area of which the MS is located. The visitor location register VLR in turn stores subscriber data of an MS temporarily while the MS is located in the area of the mobile services switching centre MSC connected to the visitor location register VLR. One visitor location register VLR typically serves one mobile services switching centre MSC. The MSs are connected to the mobile services switching centre MSC via base station systems BSS. A base station system BSS is formed of base station controllers BSC and base stations BTS. One base station controller BSC is used to control several base stations BTS.

Figure 2 illustrates the formation of a call terminating at a mobile station MS in a GSM-type mobile system utilizing a multi numbering scheme. In step 2.1, a call arrives at a first exchange GMSC of the network, which transmits a routing information request (message 2.2) to the subscriber home location register HLR that is determined according to the subscriber number MSISDN. The routing information request message 2.2 also contains the MSISDN. In location updating, the home location register HLR of the

subscriber is provided with updated data about the visitor location register VLR in the area of which the subscriber is located. On the basis of this data, the home location register HLR transmits to the visitor location register VLR a roaming number allocation request (message 2.3). With the roaming number allocation request the visitor location register VLR also receives an international mobile subscriber identity (IMSI) and the BCIE related to the called MSISDN (or the ISDN BCIE that arrived in message 2.2), indicating for example the network resources required by the call but not the type of the basic service. The visitor location register VLR stores the BCIE it has received and allocates a mobile station roaming number (MSRN) (event 2.4). The visitor location register VLR transmits the allocated MSRN to the home location register HLR in a response message 2.5. The home location register HLR in turn forwards the roaming number to the exchange GMSC that requested for the routing information in a message 2.6. The roaming number space is determined such that a call is always directed to the visited MSC the visitor location register VLR of which has allocated the roaming number. Therefore, the gateway exchange GMSC may route the call on the basis of the roaming number by transmitting an initial address message 2.7 to the exchange VMSC indicated by the roaming number.

After the exchange VMSC has received the initial address message 2.7, it finds during the roaming number analysis that the call is about to terminate in its own area and should not be forwarded. In such a case, the exchange VMSC asks for the data of the called subscriber from its own visitor location register VLR for the purpose of call set-up (message 2.8). In a normal situation, the visitor location register VLR returns the required data, including for example the BCIE, in a response message 2.9. If the exchange VMSC is capable of providing the data transmission resources indicated by the BCIE, the call set-up signalling illustrated by arrows 2.10 and 2.11 will be carried out between the exchange VMSC and the mobile station MS.

As described above, modern mobile systems support different tele- and bearer services. The GSM bearer services are determined in the GSM recommendation 02.02 and the teleservices in the GSM recommendation 02.03. A separate teleservice and bearer service code is determined for each teleservice and bearer service in the recommendation 09.02. For example, the teleservice code of the speech service is 00010001 and the teleservice code of the short messages originating from a mobile station is 00100010. In this

specification, all service codes are called basic service codes. One mobile subscriber may have access to different tele- and bearer services, which are referred to in this connection as basic services. As described above, it is preferable to use a multi numbering scheme, where each basic service is allocated an individual MSISDN.

In a GSM system, subscriber services are specified in a subscriber home location register HLR with the other subscriber data. Figure 3 illustrates the general implementation of subscriber data in the home location register HLR for a subscriber that has access to n basic services. The subscriber has his own IMSI that is used as subscriber identification within the mobile network. The services specified for the subscriber are related to the subscriber IMSI. According to the principle of the multi numbering scheme, each subscriber service 1 to n is provided an individual number MSISDN-1 to MSISDN-n. To each MSISDN is related one basic service code SC-1 to SC-n that determines the service. The basic service code is one of the aforementioned tele- and bearer service codes. Four different call forwarding services can be selected for each basic service, i.e. call forward unconditional (CFU), and the conditional call forwarding types call forward not reached (CFNR), call forward no answer (CFNA) and call forward busy (CFB). The CFNR includes data that the subscriber cannot be reached (IMSI detach) and the CFNA includes information about the alerting time within which the subscriber is to respond to the call.

The call set-up procedure of a call terminating at an MS is examined with reference to Figures 3 and 4, the procedure including CFU. This type of call forwarding is generally directed via the home location register HLR. Call forwarding is also directed via the home location register HLR if the subscriber cannot be reached and this data is stored in the home location register HLR. In Figure 4, the call set-up messages and events 4.1 and 4.2 are identical to events 2.1 and 2.2 shown in Figure 2 above. After the home location register HLR has received the routing information request, it finds the data concerning the call forwarding (CFU flag active) and the forwarding number (C#-n). In a system according to the GSM standards, the home location register HLR returns data about the forwarding subscriber and the forwarding number in a response to the routing information request (event 4.3), but no information on the type of the transferred call.

Figure 5 shows a response (SendRoutingInfoResE, SRI-Res) to a request for routing information and an example of an extension according to the invention to the aforementioned SRI-Res message (SriResExtension). The message described is not in accordance with the current GSM recommendations, and the extension must also therefore be taken into account in the GMSC that receives the message. In the embodiment described herein, the response message is supplemented with an extension that also returns the basic service code SC-n ([9]basicService) related to the called party number and stored in the HLR to the exchange that made the routing request. According to the invention, the forwarding GMSC identifies the type of the service on the basis of the basic service code and routes the call to the forwarding number C#-n and selects the line according to the basic service code (event 4.4a or 4.4b). For example in the voice mail service described above, the forwarding GMSC guides the speech calls (4.4a) and facsimile calls (4.4b) to the VMS via different lines according to the basic service code.

In a GSM system there is also another subscriber register, the visitor location register VLR, to which some of the subscriber data stored in the home location register HLR is copied when the subscriber is located in the area of the VLR. Conditional call forwarding procedures require data about the subscriber status or the progress of the call set-up, and this data is usually directed via the VLR. In the CFNR, which takes place when the subscriber cannot be reached, the call forwarding is directed via the HLR or the VLR, depending on where the data about the unavailability of the subscriber is stored.

Examine with reference to Figure 6 the call set-up procedure of a call terminating at an MS, including conditional call forwarding in an exchange VMSC serving the mobile station. In Figure 6, the call set-up messages and events 6.1 to 6.8 are exactly as described above in connection with Figure 2. When the visitor location register VLR receives a subscriber data request 6.8 from the exchange VMSC in the case shown in Figure 6, it detects that the mobile station is busy, for example. The visitor location register VLR next checks from the subscriber data whether the mobile subscriber has activated the conditional call forwarding while the subscriber is busy. The visitor location register VLR detects that the subscriber has such conditional call forwarding to a certain forwarding number (CFB active flag) and it transmits to the exchange

VMSC a response message 6.9 commanding the exchange to carry out call forwarding to the given number.

In a GSM mobile system, data about the network requirements, such as transmission rates, number of data and stop bits etc, related to the call is transmitted in a GSM BCIE. In addition to the GSM BCIE, it is possible to use an ISDN BCIE that may arrive with the call set-up message from the fixed network. The ISDN BCIE does not directly contain data about the call type, and therefore information elements HLC (high layer compability) and LLC (low layer compability) are used simultaneously with the ISDN BCIE as the basic service data. The exchange VMSC may receive the basic service data in connection with the call set-up message, but this takes place only in some cases. Such situations include for example calls between mobile stations located in the area of the same exchange, calls between mobile stations when ISDN signalling (ISUP) is used over the entire connection and all the exchanges participating in the connection support the transmission of the basic data, or ISDN calls to a mobile station when ISDN signalling is used over each path and all the exchanges participating in the connection support the transmission of the basic service data. For example, a call set-up message related to data calls arriving from a PSTN rarely contains sufficient basic service data to unambiguously determine the call type.

Figure 7 illustrates generally the call forwarding data updated in a VLR in a GSM system in connection with location updating. At least the IMSI and the primary MSISDN according to the primary service are transferred from the HLR to the VLR. The primary MSISDN is usually the MSISDN of the speech service. In addition to these, a list of the basic services available to the subscriber and related data, such as activations and forwarding numbers, are updated in the VLR. Since the CFU is directed via the HLR, the data related thereto is not updated in the VLR.

A roaming number allocation request is directed to the visitor location register VLR on the basis of the IMSI and it contains the BCIE related to the called party number MSISDN in the home location register. The basic service data is transmitted from the visitor location register VLR to the exchange VMSC in a response 6.9 to the service data request according to the prior art.

In the arrangement according to the invention, when the forwarding VMSC obtains data about the call forwarding and the forwarding number from

the subscriber database, substantially from the VLR, it forms the basic service code on the basis of the basic service data that is either received in the call set-up message or forwarded in the signalling between the exchange and the subscriber database, substantially in the response to the subscriber data request. This is a normal function of the VMSC that takes place substantially on the basis of the BCIE. In the following, a few examples are given concerning how a conversion can be carried out. For example, if the information transfer capability (ITC) value of the BCIE in octet 3 is 000 (bits 1, 2 and 3), the basic service code may be the speech service (telephone) = 00010001. If the ITC value of the BCIE is 011, the basic service code will be the automatic facsimile group 3 = 01100010. The above-described analyses and conversions are only examples. In practice, a conversion can be carried out by means of any suitable analysis.

After the exchange VMSC has formed the basic service code, it routes the call to the forwarding number C#-n according to the basic service code (event 6.10). For example in the above-described case of the voice mail service, the forwarding exchange GMSC guides the speech calls (6.10a) and facsimile calls (6.10b) to the VMS along different lines by means of the basic service code.

Examine another example of the use of the basic service code in the routing of call forwarding in a situation, described with reference to Figure 8, where a GSM subscriber transfers calls abroad. The subscriber can use two network connections which are distinguished from one another by a prefix and one of which provides a cheaper connection of less good quality and the other one provides a good quality connection that is more expensive. It would be advantageous for the subscriber if the incoming speech calls could be automatically directed via the cheaper network connection and the good quality connection could be used to transmit facsimiles. According to the prior art, a subscriber is not able to select the network of a transferred call specifically for each basic service, since the home location register HLR stores the forwarding number in the form <country code-subscriber number>, nature of address indicator = international, and not for example in the form <prefix-country code-network indicator-subscriber number>. Also, the type of an analogue call arriving from a PSTN can only be analyzed in the home location register HLR on the basis of the MSISDN. By means of the arrangement according to the invention, the forwarding exchange GMSC receives data

about the basic service of the incoming call in the form of the basic service code. If the exchange is determined to add before the forwarding number a prefix that indicates the network connection and that is selected according to the basic service code, the transferred call is automatically routed via the connection that is determined to be the most suitable for the call type.

The above-described routing examples only illustrate the possibilities of utilizing the arrangement according to the invention, but the invention is not restricted to these examples, however. The routing of calls separated according to the basic service can be selected specifically for each application.

The method according to the invention is also applicable for use in networks which use optimal routing. Figure 9 illustrates conditional call forwarding in a network supporting optimal routing. In Figure 9, the call set-up messages and events 9.1 to 9.9 are mainly similar to events 6.1 to 6.9 described above in connection with Figure 6. The home location register HLR transmits the basic service code to the gateway exchange GMSC in an extended response message to the routing information request. The call set-up proceeds as described above until the exchange VMSC obtains data about the call forwarding and the forwarding number from the visitor location register VLR in event 9.9. The exchange VMSC then returns the call to the gateway exchange GMSC (event 9.10) according to the optimal routing, and the exchange GMSC carries out the transfer to the forwarding number by selecting the forward routing for example in the above-described manner on the basis of the basic service code obtained in the response to the routing information request (9.11a or 9.11b).

The flow chart of Figure 10 illustrates a method according to the invention in case of call forwarding directed via the HLR. In step 101, the GMSC receives a call addressed to an MS to a number MSISDN. It is detected in connection with the routing information request that the subscriber has specified unconditional call forwarding (step 102). The HLR retrieves the basic service code SC corresponding to the MSISDN and the forwarding number C# (step 103) and returns them to the GMSC in step 104. After the GMSC has received data about the call forwarding, it receives the basic service code SC related to the call and routes the call to the forwarding number C# in the manner indicated by the basic service code.

The flow chart of Figure 11 illustrates the method correspondingly in case of call forwarding directed via the VLR when the call set-up has proceeded to the VMSC as shown in Figure 2 (events 2.1 to 2.7). After the VMSC has received the call set-up message and detected that it terminates at its own service area, the VMSC transmits a subscriber data request concerning the MSRN to the VLR (step 111). The VLR detects the call forwarding (step 112), retrieves the basic service data corresponding to the MSRN and updated with the roaming number allocation request (step 113) and transmits them to the forwarding VMSC (step 114) in the response message to the subscriber data request. After the VMSC has received the response message, it separates from the message the basic service data transmitted by the VLR and forms a basic service code SC on the basis of this data (step 115). The VMSC thereafter routes the call to the forwarding number C# in the manner indicated by the basic service code (step 116).

It is obvious for a person skilled in the art that as the technology develops the basic idea of the invention can be implemented in several different manners. The invention and the embodiments thereof are therefore not restricted to the above-described examples, but they may vary within the scope of the claims. Even though the invention is described above in connection with a GSM-type mobile system, the invention can also be applied in other similar mobile systems.

CLAIMS

1. A method for implementing call forwarding in a mobile system comprising at least one forwarding exchange (GMSC; VMSC) for carrying out call forwarding on the basis of subscriber data related to the call forwarding, at least one subscriber database (HLR; VLR) for storing the subscriber data related to the call forwarding, the method comprising the steps of

receiving at the forwarding exchange (GMSC; VMSC) a call set-up message addressed to a subscriber in the mobile system,

performing a subscriber data request to the subscriber database (HLR; VLR),

transmitting a response message from the subscriber database (HLR; VLR) to the forwarding exchange (GMSC; VMSC), the message containing data indicating the call forwarding and a forwarding number, **characterized** by

providing the forwarding exchange (GMSC; VMSC) with a basic service code, and

implementing call routing to the forwarding number according to the basic service code.

2. A method for implementing call forwarding in a mobile system comprising at least a first exchange (GMSC) for carrying out call forwarding on the basis of subscriber data related to the call forwarding, at least one home location register (HLR) connected to the first exchange for storing the subscriber data related to the call forwarding, the method comprising the steps of

receiving at the first exchange (GMSC) a call set-up message addressed to a subscriber in the mobile system,

requesting routing information from the home location register (HLR),

transmitting a response message from the home location register (HLR) to the first exchange (GMSC), the message containing data indicating the call forwarding and a forwarding number, **characterized** by

providing the forwarding exchange (GMSC) with a basic service code indicating the basic service related to the call in connection with the call set-up message or a response message to said routing information request,

implementing call routing to the forwarding number according to said basic service code.

3. A method according to claim 2, **characterized** in that the basic service code is forwarded from the home location register (HLR) to the first exchange (GMSC) via an extension added to the response message Send_Routing_Info_RES to the routing information request.

4. A method for implementing call forwarding in a mobile system comprising at least one exchange (VMSC) for carrying out call forwarding on the basis of subscriber data related to the call forwarding, at least one visitor location register (VLR) for storing the subscriber data related to the call forwarding, the method comprising the steps of

receiving at the exchange (VMSC) a call set-up message addressed to a subscriber in the mobile system,

providing a subscriber data request to the visitor location register (VLR) connected to the exchange,

transmitting a response message from the visitor location register (VLR) to the exchange (VMSC), the message containing data indicating the call forwarding and a forwarding number, **characterized** by

providing the forwarding exchange (VMSC) with a basic service code in connection with the call set-up message or said response message, and

implementing call routing to the forwarding number according to the basic service code.

5. A home location register (HLR) connected to a first exchange (GMSC) in a mobile system, **characterized** in that the home location register (HLR) is arranged to transmit a basic service code to the first exchange (GMSC) in connection with a response message to a routing information request, the data indicating the basic service related to the call.

6. A home location register (HLR) according to claim 5, **characterized** in that the home location register (HLR) is arranged to forward the basic service code to the first exchange (GMSC) by means of an extension added to the response message Send_Routing_Info_RES to the routing information request.

7. A first exchange (GMSC) in a mobile system, comprising means for transferring a call to a forwarding number, **characterized** in that the exchange is arranged to derive a basic service code from the call set-up

message or from a response message transmitted by the home location register (HLR) to the first exchange (GMSC) in response to a subscriber data request, and

the exchange (GMSC) is arranged to route the call to the forwarding number according to the basic service code.

8. An exchange according to claim 7, **characterized** in that the exchange is arranged to receive the basic service code in an extension added to the response message Send_Routing_Info_RES to the routing information request.

9. An exchange (GMSC) according to claim 7, **characterized** in that the exchange is arranged to transfer a call to the VMS via different lines and to select the line used in the transfer according to the basic service code.

10. An exchange (GMSC) according to claim 7, **characterized** in that the exchange (GMSC) is arranged to subject the forwarding number to a conversion selected according to the basic service code.

11. An exchange (VMSC) in a mobile system, comprising means for transferring a call to a forwarding number, **characterized** in that the exchange is arranged to derive a basic service code from basic service data that indicates the basic service of the call and that is transmitted in connection with the call set-up message or a response message transmitted from the visitor location register (VLR) to the exchange (VMSC) in response to a subscriber data request, and

the exchange (VMSC) is arranged to perform routing to the forwarding number according to said basic service code.

12. An exchange according to claim 11, **characterized** in that the exchange is arranged to derive the basic service code at least on the basis of the bearer capability information element contained in the basic service data.

13. An exchange (VMSC) according to claim 11, **characterized** in that the exchange is arranged to transfer a call to the VMS via different lines and to select the line used in the transfer according to the basic service code.

14. An exchange (VMSC) according to claim 11, **characterized** in that the exchange (VMSC) is arranged to subject the forwarding number to a conversion selected according to the basic service code.

Fig. 1

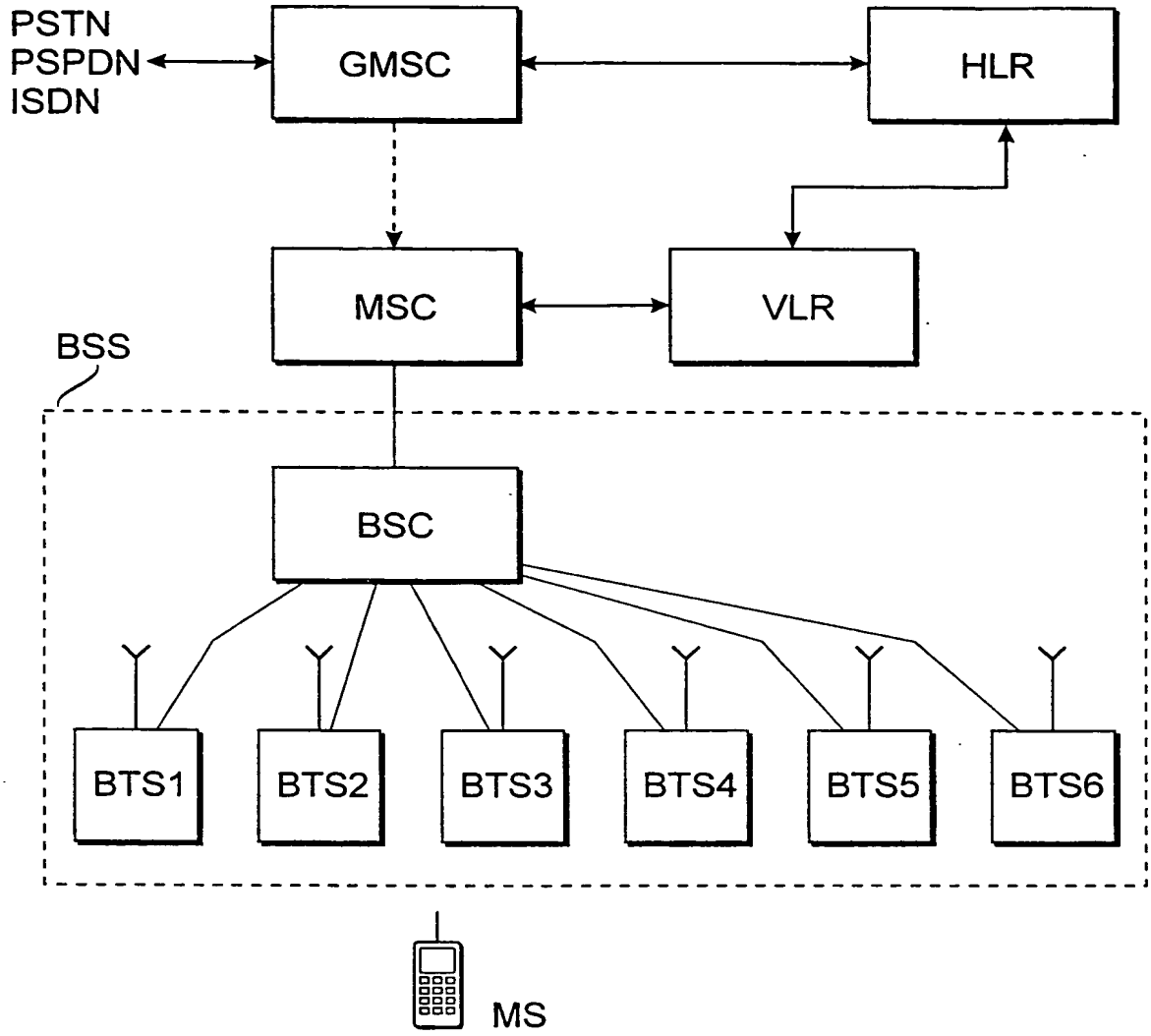

PSTN
PSPDN
ISDN
GMSC
HLR
MSC
VLR
BSS
BSC
BTS1
BTS2
BTS3
BTS4
BTS5
BTS6
MS

Fig. 2

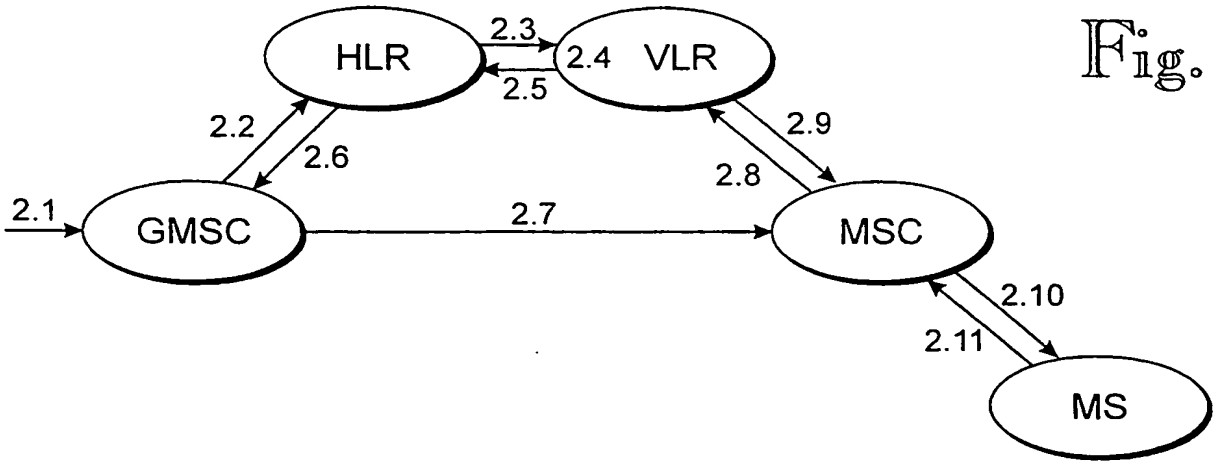
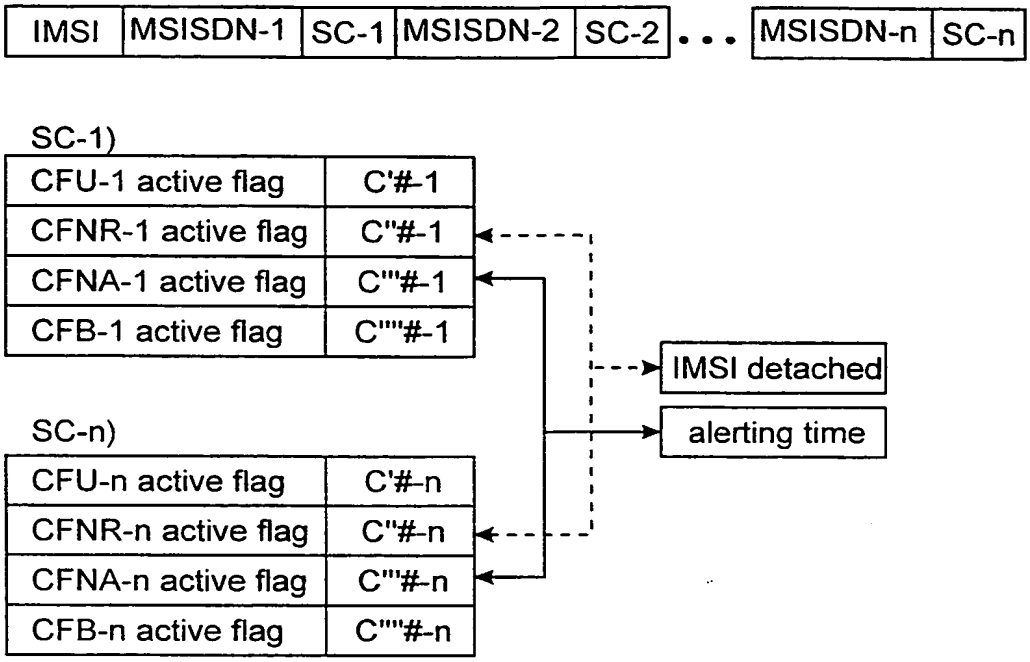

HLR
2.3
2.4
VLR
2.5
2.2
2.6
2.9
2.8
2.1
GMSC
2.7
MSC
2.10
2.11
MS

Fig. 3


IMSI
MSISDN-1
SC-1
MSISDN-2
SC-2
MSISDN-n
SC-n
SC-1)
CFU-1 active flag
C'#-1
CFNR-1 active flag
C''#-1
CFNA-1 active flag
C'''#-1
CFB-1 active flag
C''''#-1
SC-n)
CFU-n active flag
C'#-n
CFNR-n active flag
C''#-n
CFNA-n active flag
C'''#-n
CFB-n active flag
C''''#-n
IMSI detached
alerting time

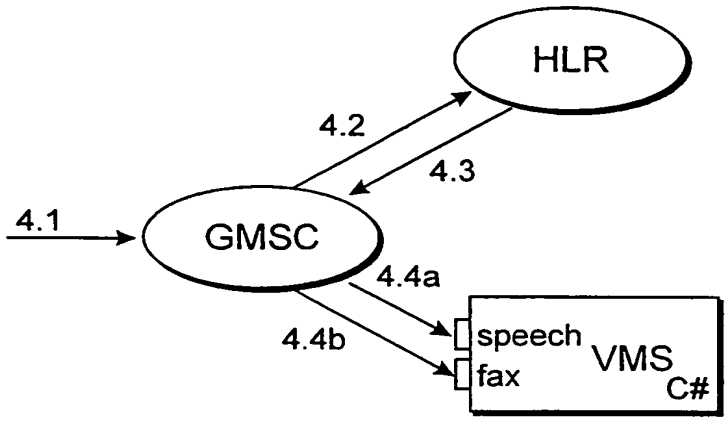


Fig. 4

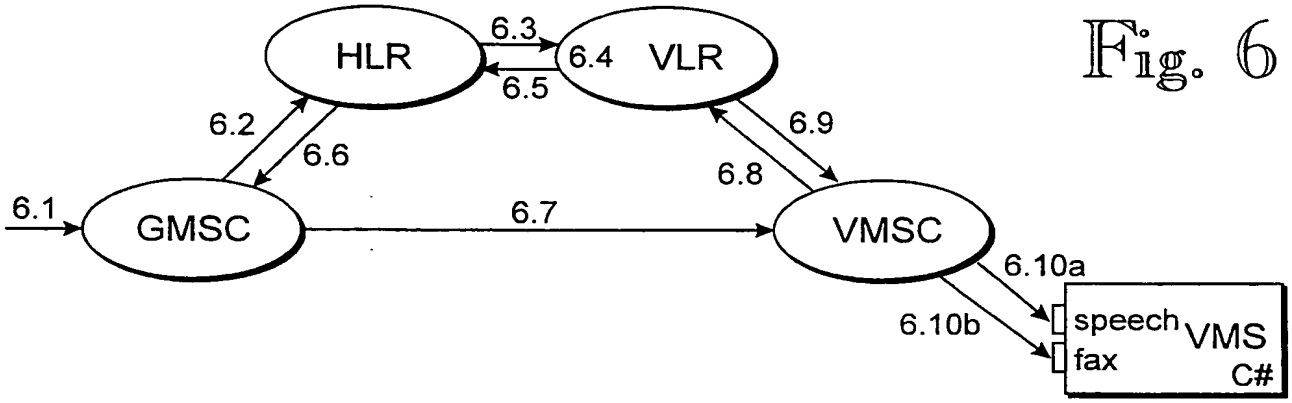


Fig. 6

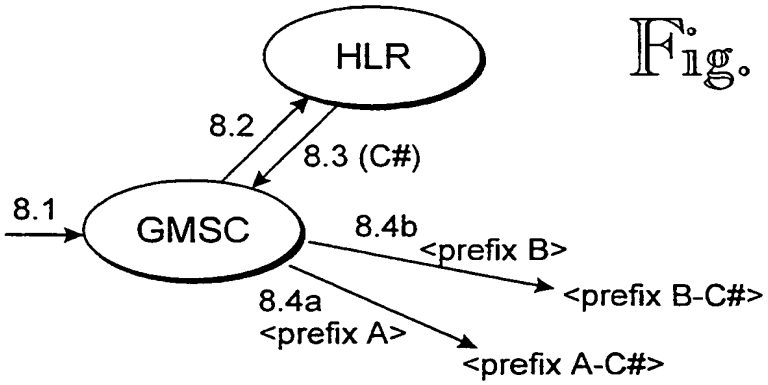


Fig. 8

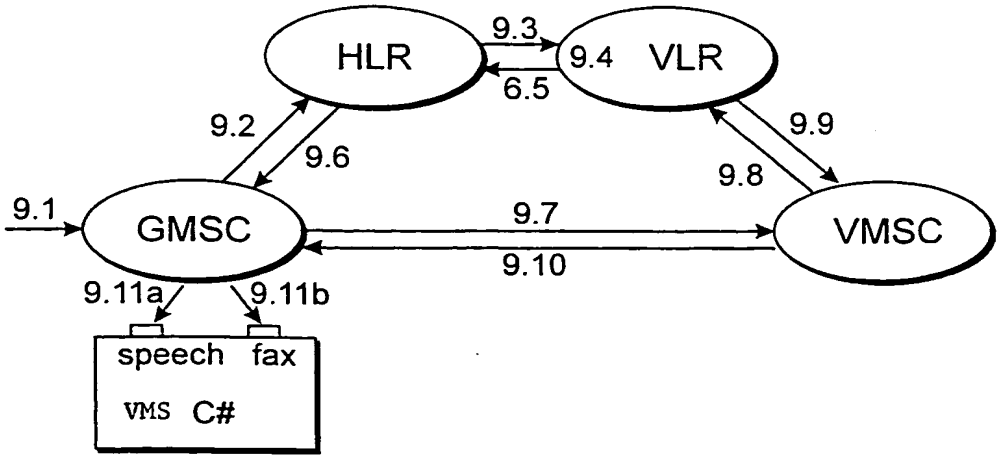


Fig. 9

Fig. 5

```
SendRoutingInfoResE ::= SEQUENCE (
imsi                              IMSI,
routingInfo                       RoutingInfo,
cug-CheckInfo                     CUG-CheckInfo      OPTIONAL,
pni                               PnpIndex           OPTIONAL,
sriResExtension   [PRIVATE 0]     SriResExtension    OPTIONAL,
ansiSriResExt     [PRIVATE 30]    ANSISriResExt      OPTIONAL
...)
```

```
SriResExtension ::= [PRIVATE 0] SEQUENCE (
inTriggerKey      [0]             InTriggerKey       OPTIONAL,
vlrNumber         [1]             ISDN-AddressString OPTIONAL,
activeSs          [2]             ActiveSS-List      OPTIONAL,
traceReference    [3]             TraceReference     OPTIONAL,
traceType         [4]             TraceType          OPTIONAL,
omc-Id            [5]             AddressString      OPTIONAL,
hotBilling        [6]             BOOLEAN            OPTIONAL,
cfoIsDone         [7]             BOOLEAN            OPTIONAL,
cfInCug           [8]             BOOLEAN            OPTIONAL,
basicService      [9]             BasicServiceCode   OPTIONAL,
category          [10]            Category           OPTIONAL,
routingCategory   [11]            RoutingCategory    OPTIONAL,
pnpIndex          [12]            PnpIndex           OPTIONAL,
nokia-CUG         [13]            Nokia-CUG-Data     OPTIONAL,
noBarrings        [14]            NULL               OPTIONAL,
odb-Data          [15]            ODB-Data           OPTIONAL
...)
```

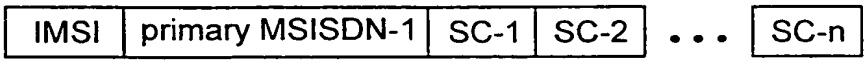


Fig. 7

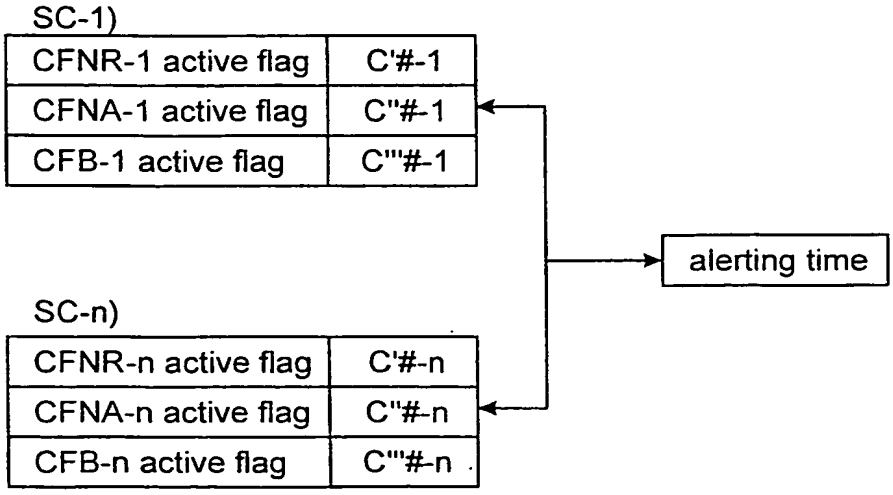


Fig. 10

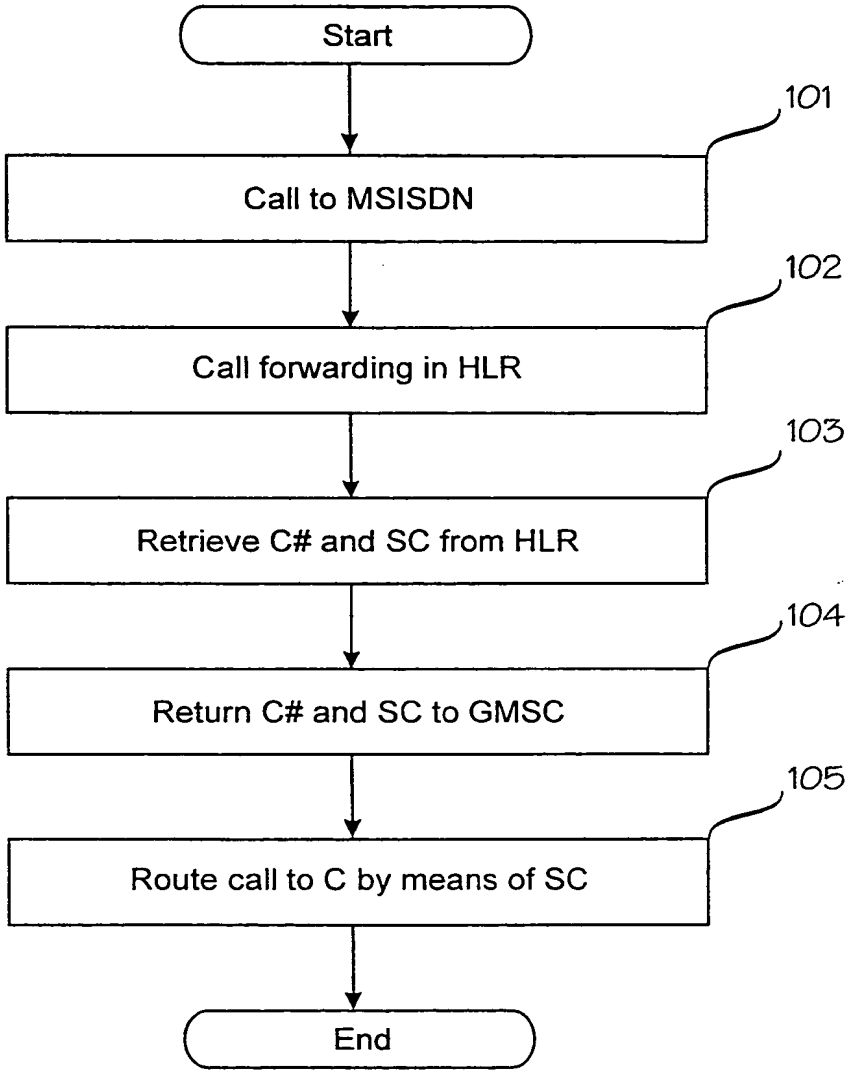
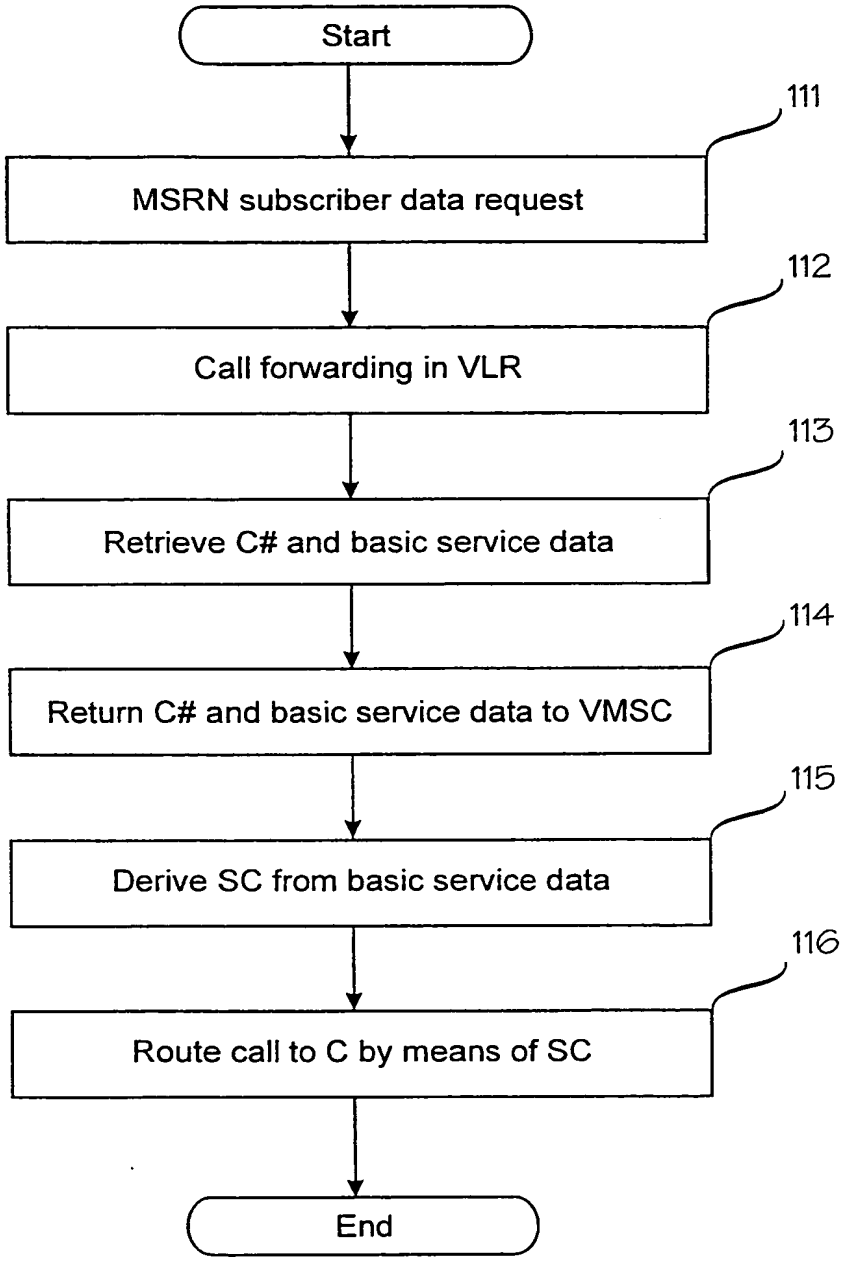

Start
101
Call to MSISDN
102
Call forwarding in HLR
103
Retrieve C# and SC from HLR
104
Return C# and SC to GMSC
105
Route call to C by means of SC
End

Fig. 11


Start
111
MSRN subscriber data request
112
Call forwarding in VLR
113
Retrieve C# and basic service data
114
Return C# and basic service data to VMSC
115
Derive SC from basic service data
116
Route call to C by means of SC
End

INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI 98/00545

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: H04Q 7/38, H04Q 7/22
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: H04Q, H04M, H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPODOC, WPI

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 9717816 A1 (NOKIA TELECOMMUNICATIONS OY), 15 May 1997 (15.05.97), page 9, line 26 - page 12, line 35 --	1-14
X	WO 9531076 A2 (NOKIA TELECOMMUNICATION OY), 16 November 1995 (16.11.95), page 5, line 3 - line 23; page 5, line 28 - line 35; page 6, line 1 - line 4 --	1,2,4,5,7,11
A	WO 9707643 A1 (NOKIA TELECOMMUNICATION OY), 27 February 1997 (27.02.97), see the claims --	1-14

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" erlier document but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
9 December 1998	11 -12- 1998
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. + 46 8 666 02 86	Authorized officer Peter Hedman Telephone No. + 46 8 782 25 00

INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI 98/00545

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 9520299 A1 (TELEFONAKTIEBOLAGET LM ERICSSON), 27 July 1995 (27.07.95), page 11, line 32 - page 13, line 4 --	1-14
P,X	WO 9826621 A2 (TELEFONAKTIEBOLAGET LM ERICSSON), 18 June 1998 (18.06.98), page 3, line 24 - line 31; page 4, line 1 - line 15; page 9, line 9 - line 24, page 10, line 10 - line 29 -- --------	1-14

INTERNATIONAL SEARCH REPORT

Information on patent family members

03/11/98

International application No.
PCT/FI 98/00545

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9717816 A1	15/05/97	AU 7301396 A	29/05/97
		EP 0872147 A	21/10/98
		FI 101119 B	15/04/98
		FI 955331 A	07/05/97
WO 9531076 A2	16/11/95	AU 683163 B	30/10/97
		AU 2346595 A	29/11/95
		EP 0707776 A	24/04/96
		FI 97934 B,C	29/11/96
		FI 942053 A	05/11/95
		JP 8512447 T	24/12/96
WO 9707643 A1	27/02/97	AU 6661796 A	12/03/97
		EP 0846400 A	10/06/98
		FI 101185 B	30/04/98
		FI 953917 A	22/02/97
WO 9520299 A1	27/07/95	AU 682924 B	23/10/97
		AU 1547995 A	08/08/95
		CA 2157662 A	27/07/95
		CN 1124083 A	05/06/96
		EP 0719490 A	03/07/96
		FI 954392 A	18/09/95
		JP 8511150 T	19/11/96
		NO 953612 A	20/11/95
		NZ 278985 A	24/11/97
		SG 48268 A	17/04/98
		US 5504804 A	02/04/96
		ZA 9500433 A	24/11/95
WO 9826621 A2	18/06/98	AU 5423598 A	03/07/98

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 43188PCT/nu	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/FI98/00545	International filing date *(day/month/year)* 22.06.1998	Priority date *(day/month/year)* 27.06.1997
International Patent Classification (IPC) or national classification and IPC_6 H 04 Q 7/38, H 04 Q 7/22		
Applicant Nokia Telecommunications Oy et al		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 4 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 4 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the report
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
22.01.1999	05.10.1999
Name and mailing address of the IPEA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. 08-667 72 88	Telex 17978 PATOREG-S
Authorized officer Peter Hedman/MN Telephone No. 08-782 25 00	

Form PCT/IPEA/409 (cover sheet) (January 1994)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/FI98/00545

I. Basis of the report

1. This report has been drawn on the basis of *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.)*:

☐ the international application as originally filed.

☒ the description, pages 1-13 , as originally filed,
pages _____ , filed with the demand,
pages _____ , filed with the letter of _____ ,
pages _____ , filed with the letter of _____ .

☒ the claims, Nos. _____ , as originally filed,
Nos. _____ , as amended under Article 19,
Nos. _____ , filed with the demand,
Nos. 1-14 , filed with the letter of 23.08.1999 ,
Nos. _____ , filed with the letter of _____ .

☒ the drawings, ~~sheets~~/fig 1-11 , as originally filed,
~~sheets~~/fig _____ , filed with the demand
~~sheets~~/fig _____ , filed with the letter of _____ ,
~~sheets~~/fig _____ , filed with the letter of _____ .

2. The amendments have resulted in the cancellation of:

☐ the description, pages _____
☐ the claims, Nos. _____
☐ the drawings, ~~sheets~~/fig _____

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the supplemental Box (Rule 70.2(c)).

4. Additional observations, if necessary:

V. Resoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	1-14	YES
	Claims		NO
Inventive step (IS)	Claims	1-14	YES
	Claims		NO
Industrial applicability (IA)	Claims	1-14	YES
	Claims		NO

2. Citations and explanations

The claimed invention relates to a method, and thereto related nodes, for implementing call forwarding in a mobile communication system wherein calls are automatically routed specifically for each basic service.

The problem mentioned above is, according to the claimed invention, solved by way of providing the forwarding exchange (GMSC; VMSC) with a basic service code, and by implementing call routing to the forwarding number according to the basic service code.

In the international search report the following documents were cited:

D1 WO 97 17816 A
D2 WO 95 310 76 A
D3 WO 97 07643 A
D4 O 95 20299 A

D1 teaches of a system, method and a visitor location register (VLR) for providing a service-dependent routing of a mobile-terminating call in a mobile communication system. In response to a roaming number request from a home location register (HLR), a visitor location register allocates a roaming number, comprising a service dependent part (SERVN), to the call. The roaming number is returned to the HLR and further to a routing exchange (GMSC, EXC). In the service dependent part one of two alternative routes is indicated, and thereby the routing exchange may route the call in accordance with the service requirements (See page 9, line 26 - page 12, line 35). The document fails to discuss call forwarding. Furthermore, calls are routed based on a roaming number, instead of being based on a basic service code, as suggested in the claimed invention.

.../...

Supplemental Box
(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of: V

D2 relates to a call forwarding method and arrangement for a mobile terminating call. Upon noticing that a called subscriber is busy, not reachable or does not answer, the HLR/VLR is checked for an activated call forwarding. As a reply to the roaming number allocation request, a reply message, comprising, in addition to the forwarding number, a BCIE, which is indicating the type of the call (data/speech), is transmitted to the requesting node (See page 5, line 3 - line 23; page 5, line 28 page 6, line 4). Although this document do discuss call forwarding, also D2 fails to teach of a method in which calls are routed base on a basic service code.

D3 refers to a method and a visitor location register for handling outgoing and incoming calls in a mobile communictions system employing a multi-numbering scheme. By providing an MSC with the correct one of multiple directory numbers according to a basic service related to a call, from a HLR via the VLR occasionaly serving the called subscriber, service specific routing of calls is achieved. The document do teach of a basic service code, which is utilised when employing a multi-numbering scheme. The document do, however, fail to teach of a procedure for providing call forwarding by way of providing a certain forwarding exchange with the basic service code.

D4 relates to a system, method and a thereto related MSC and HLR, for providing individual subscriber services in a cellular communications network, wherein the MSC sends a status information to the HLR, after which the HLR responds by determining supplementary call routing information (See page 11, line 32 - page 13, line 4). Also this document do fail to suggest the utilisation of a basic service code when providing call forwarding ot the subscriber.

None of the cited documents do teach of a method for providing call forwarding to a subscriber by way of providing a basic service code to the forwarding exchange, and, thereby, simplifies the procedure of providing call forwarding for roaming subscribers. Since it is not considered as obvious to the person skilled in the art to come up with a comparable solution, considering what is previously known from the cited documents, what is claimed in the amended claims 1-14 is novel, is considered to involve an inventive step, and have industrial applicability.

CLAIMS

1. A method for implementing call forwarding in a mobile system comprising at least one forwarding exchange (GMSC; VMSC) for carrying out call forwarding on the basis of subscriber data related to the call forwarding, at least one subscriber database (HLR; VLR) for storing the subscriber data related to the call forwarding, the method comprising the steps of

receiving at the forwarding exchange (GMSC; VMSC) a call set-up message addressed to a subscriber in the mobile system,

performing a subscriber data request to the subscriber database (HLR; VLR),

transmitting a response message from the subscriber database (HLR; VLR) to the forwarding exchange (GMSC; VMSC), the message containing data indicating the call forwarding and a forwarding number, **characterized** by

providing the forwarding exchange (GMSC; VMSC) with a basic service code, and

implementing call routing to the forwarding number according to the basic service code.

2. A method for implementing call forwarding in a mobile system comprising at least a first exchange (GMSC) for carrying out call forwarding on the basis of subscriber data related to the call forwarding, at least one home location register (HLR) connected to the first exchange for storing the subscriber data related to the call forwarding, the method comprising the steps of

receiving at the first exchange (GMSC) a call set-up message addressed to a subscriber in the mobile system,

requesting routing information from the home location register (HLR),

transmitting a response message from the home location register (HLR) to the first exchange (GMSC), the message containing data indicating the call forwarding and a forwarding number, **characterized** by

providing the forwarding exchange (GMSC) with a basic service code indicating the basic service related to the call in connection with the call set-up message or a response message to said routing information request,

Replaced by Article 34

implementing call routing to the forwarding number according to said basic service code.

3. A method according to claim 2, **characterized** in that the basic service code is forwarded from the home location register (HLR) to the first exchange (GMSC) via an extension added to the response message Send_Routing_Info_RES to the routing information request.

4. A method for implementing call forwarding in a mobile system comprising at least one exchange (VMSC) for carrying out call forwarding on the basis of subscriber data related to the call forwarding, at least one visitor location register (VLR) for storing the subscriber data related to the call forwarding, the method comprising the steps of

receiving at the exchange (VMSC) a call set-up message addressed to a subscriber in the mobile system,

providing a subscriber data request to the visitor location register (VLR) connected to the exchange,

transmitting a response message from the visitor location register (VLR) to the exchange (VMSC), the message containing data indicating the call forwarding and a forwarding number, **characterized** by

providing the forwarding exchange (VMSC) with a basic service code in connection with the call set-up message or said response message, and

implementing call routing to the forwarding number according to the basic service code.

5. A home location register (HLR) connected to a first exchange (GMSC) in a mobile system, **characterized** in that the home location register (HLR) is arranged to transmit a basic service code to the first exchange (GMSC) in connection with a response message to a routing information request, the data indicating the basic service related to the call.

6. A home location register (HLR) according to claim 5. **characterized** in that the home location register (HLR) is arranged to forward the basic service code to the first exchange (GMSC) by means of an extension added to the response message Send_Routing_Info_RES to the routing information request.

7. A first exchange (GMSC) in a mobile system, comprising means for transferring a call to a forwarding number, **characterized** in that the exchange is arranged to derive a basic service code from the call set-up

message or from a response message transmitted by the home location register (HLR) to the first exchange (GMSC) in response to a subscriber data request, and

the exchange (GMSC) is arranged to route the call to the forwarding number according to the basic service code.

8. An exchange according to claim 7, **characterized** in that the exchange is arranged to receive the basic service code in an extension added to the response message Send_Routing_Info_RES to the routing information request.

9. An exchange (GMSC) according to claim 7, **characterized** in that the exchange is arranged to transfer a call to the VMS via different lines and to select the line used in the transfer according to the basic service code.

10. An exchange (GMSC) according to claim 7, **characterized** in that the exchange (GMSC) is arranged to subject the forwarding number to a conversion selected according to the basic service code.

11. An exchange (VMSC) in a mobile system, comprising means for transferring a call to a forwarding number, **characterized** in that the exchange is arranged to derive a basic service code from basic service data that indicates the basic service of the call and that is transmitted in connection with the call set-up message or a response message transmitted from the visitor location register (VLR) to the exchange (VMSC) in response to a subscriber data request, and

the exchange (VMSC) is arranged to perform routing to the forwarding number according to said basic service code.

12. An exchange according to claim 11, **characterized** in that the exchange is arranged to derive the basic service code at least on the basis of the bearer capability information element contained in the basic service data.

13. An exchange (VMSC) according to claim 11, **characterized** in that the exchange is arranged to transfer a call to the VMS via different lines and to select the line used in the transfer according to the basic service code.

14. An exchange (VMSC) according to claim 11, **characterized** in that the exchange (VMSC) is arranged to subject the forwarding number to a conversion selected according to the basic service code.

RECORD COPY

PCT

REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

For receiving Office use only

International Application No. PCT/FI 9 8 / 0 0 5 4 5

International Filing Date 22 JUN 1998 (22. 06. 98)

The Finnish Patent Office
PCT International Application

Name of receiving Office and "PCT International Application"

Applicant's or agent's file reference
(if desired) (12 characters maximum) 2961612PC/ko

Box No. I TITLE OF INVENTION

Routing of call forwarding according to basic services

Box No. II APPLICANT

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (i.e.. country) of residence if no State of residence is indicated below.)*

NOKIA TELECOMMUNICATIONS OY
Keilalahdentie 4
FIN-02150 Espoo
Finland

☐ This person is also inventor

Telephone No.

Facsimile No.

Teleprinter No.

State *(i.e. country)* of nationality: FI

State *(i.e. country)* of residence: FI

This person is applicant for the purposes of: ☐ all designated States ☒ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box

Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (i.e.. country) of residence if no State of residence is indicated below.)*

PALVIAINEN Keijo
Halmetie 6 A 2
FIN-00700 Helsinki
Finland

This person is:

☐ applicant only

☒ applicant and inventor

☐ inventor only *(If this check-box is marked, do not fill in below.)*

State *(i.e. country)* of nationality: FI

State *(i.e. country)* of residence: FI

This person is applicant for the purposes of: ☐ all designated States ☐ all designated States except the United States of America ☒ the United States of America only ☐ the States indicated in the Supplemental Box

☐ Further applicants and/or (further) inventors are indicated on a continuation sheet.

Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE

The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as: ☒ agent ☐ common representative

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

KOLSTER OY AB
Iso Roobertinkatu 23
P.O. Box 148
FIN-00121 Helsinki
Finland

Telephone No. 358-9-618821

Facsimile No. 358-9-602244

Teleprinter No.

☐ Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

Box No. V DESIGNATION OF STATES

The following designations are hereby made under Rule 4.9(a) *(mark the applicable check-boxes; at least one must be marked)*:

Regional Patent

- ☒ **AP** **ARIPO Patent:** GH Ghana, GM Gambia, KE Kenya, LS Lesotho, MW Malawi, SD Sudan, SZ Swaziland, UG Uganda, ZW Zimbabwe, and any other State which is a Contracting State of the Harare Protocol and of the PCT
- ☒ **EA** **Eurasian Patent:** AM Armenia, AZ Azerbaijan, BY Belarus, KG Kyrgyzstan, KZ Kazakstan, MD Republic of Moldova, RU Russian Federation, TJ Tajikistan, TM Turkmenistan, and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT
- ☒ **EP** **European Patent:** AT Austria, BE Belgium, CH and LI Switzerland and Liechtenstein, CY Cyprus, DE Germany, DK Denmark, ES Spain, FI Finland, FR France, GB United Kingdom, GR Greece, IE Ireland, IT Italy, LU Luxembourg, MC Monaco, NL Netherlands, PT Portugal, SE Sweden, and any other State which is a Contracting State of the European Patent Convention and of the PCT
- ☒ **OA** **OAPI Patent:** BF Burkina Faso, BJ Benin, CF Central African Republic, CG Congo, CI Côte d'Ivoire, CM Cameroon, GA Gabon, GN Guinea, ML Mali, MR Mauritania, NE Niger, SN Senegal, TD Chad, TG Togo, and any other State which is a member State of OAPI and a Contracting State of the PCT *(if other kind of protection or treatment desired, specify on dotted line)*

.....

National patent *(if other kind of protection or treatment desired, specify on dotted line)*:

- ☒ **AL** Albania .....
- ☒ **AM** Armenia .....
- ☒ **AT** Austria and utility model .....
- ☒ **AU** Australia .....
- ☒ **AZ** Azerbaijan
- ☒ **BA** Bosnia and Herzegovina .....
- ☒ **BB** Barbados
- ☒ **BG** Bulgaria .....
- ☒ **BR** Brazil .....
- ☒ **BY** Belarus
- ☒ **CA** Canada
- ☒ **CH and LI** Switzerland and Liechtenstein
- ☒ **CN** China .....
- ☒ **CU** Cuba .....
- ☒ **CZ** Czech Republic and utility model .....
- ☒ **DE** Germany and utility model .....
- ☒ **DK** Denmark and utility model .....
- ☒ **EE** Estonia and utility model .....
- ☒ **ES** Spain .....
- ☒ **FI** Finland and utility model .....
- ☒ **GB** United Kingdom
- ☒ **GE** Georgia .....
- ☒ **GH** Ghana .....
- ☒ **GM** Gambia
- ☒ **GW** Guinea-Bissau .....
- ☒ **HU** Hungary .....
- ☒ **ID** Indonesia
- ☒ **IL** Israel .....
- ☒ **IS** Iceland
- ☒ **JP** Japan .....
- ☒ **KE** Kenya .....
- ☒ **KG** Kyrgyzstan .....
- ☒ **KP** Democratic People's Republic of Korea .....

.....

- ☒ **KR** Republic of Korea .....
- ☒ **KZ** Kazakstan .....
- ☒ **LC** Saint Lucia
- ☒ **LK** Sri Lanka
- ☒ **LR** Liberia
- ☒ **LS** Lesotho .....
- ☒ **LT** Lithuania
- ☒ **LU** Luxembourg .....
- ☒ **LV** Latvia
- ☒ **MD** Republic of Moldova .....
- ☒ **MG** Madagascar .....
- ☒ **MK** The former Yugoslav Republic of Macedonia

.....

- ☒ **MN** Mongolia
- ☒ **MW** Malawi .....
- ☒ **MX** Mexico .....
- ☒ **NO** Norway
- ☒ **NZ** New Zealand .....
- ☒ **PL** Poland .....
- ☒ **PT** Portugal .....
- ☒ **RO** Romania
- ☒ **RU** Russian Federation .....
- ☒ **SD** Sudan
- ☒ **SE** Sweden
- ☒ **SG** Singapore
- ☒ **SI** Slovenia .....
- ☒ **SK** Slovakia and utility model .....
- ☒ **SL** Sierra Leone
- ☒ **TJ** Tajikistan .....
- ☒ **TM** Turkmenistan .....
- ☒ **TR** Turkey .....
- ☒ **TT** Trinidad and Tobago .....
- ☒ **UA** Ukraine .....
- ☒ **UG** Uganda .....
- ☒ **US** United States of America .....

.....

- ☒ **UZ** Uzbekistan .....
- ☒ **VN** Viet Nam .....
- ☒ **YU** Yugoslavia .....
- ☒ **ZW** Zimbabwe .....

Check-boxes reserved for designating States (for the purposes of a national patent) which have become party to the PCT after issuance of this sheet

- ☐ .....
- ☐ .....
- ☐ .....

In addition to the designations made above, the applicant also makes under Rule 4.9(b) all designations which would be permitted under the PCT except the designation(s) of _____.

The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit. *(Confirmation of a designation consists of the filing of a notice specifying that designation and the payment of the designation and confirmation fees. Confirmation must reach the receiving Office within the 15-month time limit.)*

Box No. VI PRIORITY CLAIM Further priority claims are indicated in the Supplemental Box ☐

The priority of the following earlier application(s) is hereby claimed:

Country *(in which, or for which, the application was filed)*	Filing Date *(day/month/year)*	Application No.	Office of filing *(only for regional or international application)*
item (1) FI	27 June 1997 (27.06.1997)	972789	
item (2)			
item (3)			

Mark the following check-box if the certified copy of the earlier application is to be issued by the Office which for the purposes of the present international application is the receiving Office (a fee may be required):

☒ The receiving Office is hereby requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) identified above as item(s) : (1)

Box No. VII INTERNATIONAL SEARCHING AUTHORITY

Choice of International Searching Authority (ISA) *(If two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used):* **ISA /SE**

Earlier search *Fill in where a search (international, international-type or other) by the International Searching Authority has already been carried out or requested and the Authority is now requested to base the international search to the extent possible, on the results of that earlier search. Identify such search or request either by reference to the relevant application (or the translation thereof) or by reference to the search request*

Country (or regional Office): Date *(day/month/year):* Number:

Box No. VIII CHECK LIST

This international application contains the following number of sheets:

1. request	:	3 sheets
2. description	:	13 sheets
3. claims	:	3 sheets
4. abstract	:	1 sheets
5. drawings	:	6 sheets
Total	:	26 sheets

This international application is accompanied by the item(s) marked below

1. ☐ separate signed power of attorney
2. ☐ copy of general power of attorney
3. ☐ statement explaining lack of signature
4. ☐ priority document(s) *identified in Box No. VI as item(s):*
5. ☒ fee calculation sheet
6. ☐ separate indications concerning deposited microorganisms
7. ☐ nucleotide and/or amino acid sequence listing diskette)
8. ☒ other *(specify):* official action

Figure No. 6 of the drawings (if any) should accompany the abstract when it is published.

Box No. IX SIGNATURE OF APPLICANT OR AGENT

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request)

KOLSTER OY AB

Tapio Äkräs

For receiving Office use only

1. Date of actual receipt of the purported international application:	22 JUN 1998 (22-06-1998)	2. Drawings: ☐ received ☐ not received:
3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:		
4. Date of timely receipt of the required corrections under PCT Article 11(2):		
5. International Searching Authority specified by the applicant: ISA/SE	6. ☐ Transmittal of search copy delayed until search fee is paid	

For International Bureau use only

Date of receipt of the record copy by the International Bureau: